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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MARKHAM, WESLEY D	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/047,459	HIROYUKI ET AL.	
	Examiner	Art Unit	
	Wesley D Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *5 and 17* is/are withdrawn from consideration.

5)☒ Claim(s) *11-14* is/are allowed.

6)☒ Claim(s) *1-3,6-10,15,16,18 and 19* is/are rejected.

7)☒ Claim(s) *4 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 January 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, Claims 1 – 4, 6 – 16, and 18 – 20, drawn to a method of manufacturing an optical filter, in the reply filed on 7/12/2004 is acknowledged. The traversal is on the ground(s) that examination of the entire application would not place a serious burden on the examiner, as the claims would appear to be of an overlapping search area. This is not found persuasive because, even assuming that the search areas for the different inventions are overlapping, the search areas are not the same. This alone would place a serious burden on the examiner (i.e., to extend the search area from method claims only to method, product, and apparatus claims). Additionally, the numerous different issues that arise during the prosecution of method, product, and apparatus claims in a single application (e.g., the variety of different issues to consider in determining the patentability of different statutory classes of inventions) also place a serous burden on the examiner. As such, the requirement is still deemed proper and is therefore made FINAL. Claims 5 and 17 are withdrawn from further consideration by the examiner as being drawn to a non-elected invention.

Priority

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Oath/Declaration

3. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.The oath or declaration is defective because it does not identify the mailing / post office address of each inventor. A mailing address is an address at which an inventor customarily receives his or her mail and may be either a home or business address. The mailing address should include the ZIP Code designation. The mailing address may be provided in an application data sheet or a supplemental oath or declaration. See 37 CFR 1.63(c) and 37 CFR 1.76.

Drawings

4. The drawings filed on 1/14/2002 are objected to because of the following:

   - Figures 1, 3, and 4: The labels in the figures are hand-written, and each letter, number, and line is not sufficiently dark, uniformly thick, and well-defined, as required by 37 CFR 1.84(l).
   - The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: n_{95}, n_{96}, d_{95}, and d_{96} in Figure 1; n_{L-1}, d_{L-1} in Figure 3. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office Action to avoid abandonment of the application.

5. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office Action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office Action. The objection to the drawings will not be held in abeyance.

Specification

6. Applicant is reminded of the proper language and format for an abstract of the disclosure. The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the

abstract on the computer tape used by the printer is limited, and the abstract of the instant application is ~240 words in length.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Specifically, **Claim 18** requires, in part, using an equation relating filter transmittance to deposition time, the equation having values identified by "a_0", "a_1", "a_2", "a_3", and "a_4". However, the aforementioned values (or what they represent) are not defined or described in the claim. Since the terms "a_0" through "a_4" are not defined, the equation recited in Claim 18 is unclear, which renders the scope of the claim vague and indefinite.

Claim Observations

10. The examiner has reasonably interpreted the phrase, "said formula" in line 2 of Claim 20 to be equivalent to, "said equation" in order for the term to have proper antecedent basis in Claim 19 (from which Claim 20 depends).

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1 and 6 – 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Southwell et al. (USPN 5,425,964).

13. Regarding independent **Claim 1**, Southwell et al. teaches a method for manufacturing an optical filter (Col.1, lines 22 – 41, Col.2, lines 8 – 36, Col.3, lines 43 – 64), the method comprising depositing a material on a substrate, interpolating (i.e., "predicting") a deposition stop time during the depositing of the material but prior to reaching the predicted stop time (i.e., the "QuitTime"), and stopping deposition substantially at the predicted stop time (Figures 3 and 4; Col.2, lines 37 – 65, Col.5, lines 5 – 48, Col.6, lines 41 – 68, Col.7, lines 54 – 68, Col.8, lines 1 – 5 and 37 – 67, and Col.9, lines 1 – 30). Regarding independent **Claim 6**, Southwell et al. teaches an improved method of depositing a layer of material having a desired thickness onto a substrate to form an optical filter (Col.1, lines 22 – 41, Col.2, lines 8 – 36, Col.3, lines 43 – 64), wherein the improvement comprises interpolating (i.e., "predicting"), during the process of depositing the layer but before reaching the desired thickness, a time at which to stop depositing the film (i.e., the "QuitTime") by measuring an optical property of the film and utilizing that measurement to

determine a time at which the desired thickness will be reached (Figures 3 and 4; Col.2, lines 37 – 65, Col.5, lines 5 – 48, Col.6, lines 41 – 68, Col.7, lines 54 – 68, Col.8, lines 1 – 5 and 37 – 67, and Col.9, lines 1 – 30). Regarding **Claim 7**, Southwell et al. also teaches that the optical property is light (i.e., energy) reflectance (Abstract, Col.2, lines 50 – 65, Col.6, lines 65 – 68, and Col.7, lines 1 – 11). Regarding **Claim 8**, Southwell et al. also teaches that the predicting comprises using a theoretical formula for the optical property, the formula having at least one theoretical constant (Col.5, lines 5 – 48, Col.8, lines 50 – 68, and Col.9, lines 1 – 30, which show a number of different theoretical formulas relating to the optical property and having theoretical constants).

14. Claims 1, 6, and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Kawahara et al. (USPN 5,151,295).

15. Regarding independent **Claim 1**, Kawahara et al. teaches a method for manufacturing an optical recording medium having layer(s) whose thickness is optimized to make use of optical interference effects (i.e., an "optical filter") (Abstract, Figure 1, Col.1, lines 5 – 16 and 51 – 62), the method comprising depositing a material on a substrate, predicting a deposition stop time (i.e., time "t_1") during the depositing of the material but prior to reaching the predicted stop time, and stopping deposition substantially at the predicted stop time (Col.2, lines 33 – 68, Col.3, lines 1 – 14 and 49 – 66, Col.4, lines 5 – 44, Col.5, lines 26 – 43, and Claim 1). Regarding independent **Claim 6**, Kawahara et al. teaches an improved

method of depositing a layer of material having a desired thickness onto a substrate to form an optical filter (Abstract, Figure 1, Col.1, lines 5 – 16 and 51 – 62), wherein the improvement comprises predicting, during the process of depositing the layer but before reaching the desired thickness, a time at which to stop depositing the film (i.e., time "t_1") by measuring an optical property of the film and utilizing that measurement to determine a time at which the desired thickness will be reached (Col.2, lines 33 – 68, Col.3, lines 1 – 14 and 49 – 66, Col.4, lines 5 – 44, Col.5, lines 26 – 43, and Claim 1). Regarding **Claim 7**, Kawahara et al. also teaches that the optical property is light (i.e., energy) reflectance or transmittance (Col.2, lines 50 – 63, Col.4, lines 19 – 26, and Col.5, lines 2 – 9).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order

for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

18. Claims 1 – 3, 6 – 10, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maung et al. (USPN 5,503,707) in view of Holland (USPN 4,311,725).

19. Regarding independent **Claim 1**, Maung et al. teaches a method for manufacturing a multilayer film on a substrate (Figure 1, Col.2, lines 31 – 35, Col.3, lines 56 – 67, Col.4, lines 1 – 2), the method comprising depositing a material on a substrate, predicting a deposition stop time during the depositing of the material but prior to reaching the predicted stop time, and stopping deposition substantially at the predicted stop time (Abstract, Figures 1, 3, and 7, Col.1, lines 8 – 10, Col.2, lines 32 – 45 and 58 – 67, Col.3, lines 56 – 67, Cols.4 – 5, Col.6, lines 45 – 67, Col.7, lines 1 – 5, Col.10, lines 39 – 67, Col.11, lines 1 – 49, Col.12, lines 49 – 67, Col.13, lines 1 – 58, and Col.15, lines 1 – 38). Regarding independent **Claim 6**, Maung et al. teaches an improved method of depositing a layer of material having a desired thickness onto a substrate (Figure 1, Col.2, lines 31 – 35, Col.3, lines 56 – 67, Col.4, lines 1 – 2), wherein the improvement comprises predicting, during the process of depositing the layer but before reaching the desired thickness, a time at which to stop depositing the film by measuring an optical property of the film and utilizing that measurement to determine a time at which the desired thickness will be reached (Abstract, Figures 1, 3, and 7, Col.1, lines 8 – 10, Col.2, lines 32 – 45 and

58 – 67, Col.3, lines 56 – 67, Cols.4 – 5, Col.6, lines 45 – 67, Col.7, lines 1 – 5, Col.10, lines 39 – 67, Col.11, lines 1 – 49, Col.12, lines 49 – 67, Col.13, lines 1 – 58, and Col.15, lines 1 – 38). Regarding independent **Claim 19**, Maung et al. teaches a method for manufacturing a multilayer film on a substrate (Figure 1, Col.2, lines 31 – 35, Col.3, lines 56 – 67, Col.4, lines 1 – 2), the method comprising modeling an optical characteristic of the film with an equation that relates the optical characteristic to deposition time, and using the model to select a deposition stopping time during film formation (Abstract, Figures 1, 3, and 7, Col.1, lines 8 – 10, Col.2, lines 32 – 45 and 58 – 67, Col.3, lines 56 – 67, Cols.4 – 5, Col.6, lines 45 – 67, Col.7, lines 1 – 5, Col.10, lines 39 – 67, Col.11, lines 1 – 49, Col.12, lines 49 – 67, Col.13, lines 1 – 58, and Col.15, lines 1 – 38, which teaches using a variety of equations / models / algorithms that, either directly or indirectly, relate an optical characteristic to deposition time to select a deposition stopping time during film formation). Regarding Claim 19, Maung et al. does not explicitly teach that the equation / algorithm has a functional form that is theoretically valid at substantially all times during film deposition. However, Maung et al. does teach that the endpoint detection algorithm is utilized throughout the deposition process, can compensate for errors in thickness measurements, and makes no mention or suggestion that the equation(s) / algorithm is invalid at any point during the deposition process (Col.2, lines 32 – 45, Col.4, lines 40 – 67, Col.5, lines 1 – 27 and 60 – 67, Col.6, lines 45 – 65, Col.11, lines 42 – 49, and the equations in Cols.12 – 15, which do not appear to have a form that is invalid at any time during the process). These teachings would

at least reasonably suggest to one of ordinary skill in the art that the equation(s) of Maung et al. are valid at "substantially all times during film deposition". Further, Maung et al. does not explicitly teach that the process is used to manufacture an optical filter, as required by the claims. However, the layer(s) which are deposited in the process of Maung et al. do not appear to be particularly limited, and the process of Maung et al. has the following advantages over conventional deposition layer thickness monitoring and controlling processes: (1) the accuracy of the substrate placement can be determined prior to starting the process, (2) improper processing of previous layers can be detected, (3) the distortion of transmitted or reflected waves can be detected, (4) the process rate (and therefore, the predicted endpoint) is updated using only valid measurements (i.e., not "out-of-range" measurements), and (5) trends in the deviation from an ideal process rate are accurately accounted for (Col.2, lines 46 – 67, Col.3, lines 1 – 4). Holland teaches that, when manufacturing a multilayer film to be used as, for example, an optical filter, it is desirable to monitor and control the film growth rate and thickness (Col.1, lines 4 – 53). Holland also teaches that a conventional process used to control the thickness includes monitoring the reflectance (R) or transmittance (T) of the deposited film during the deposition process and terminating the deposition when a required value of the measured property has been reached, but such a "turning point" measurement process can lead to serious errors because R and T values change by only small amounts near the turning points (Col.2, lines 1 – 8, and Col.4, lines 21 – 29). Therefore, it would have been obvious to one of ordinary skill in the art to

utilize the fault-tolerant process of Maung et al. to manufacture a multilayer optical filter, as taught by Holland, because (1) Maung et al. teaches using the process to manufacture a multilayer film in general, and Holland teaches that an optical filter is a typical multilayer film whose layer thickness / deposition should be monitored and controlled, and (2) the fault-tolerant layer thickness control process of Maung et al. has numerous advantages over other thickness monitoring and endpoint detection processes, such as the advantages listed above (i.e., accuracy of substrate placement, detection of errors in previous layers, detection of distortion of transmitted or reflected light, and the ability to control the process and determine the endpoint using only valid data while compensating for deviations from ideal). Regarding **Claim 2**, the combination of Maung et al. and Holland also teaches that the predicting comprises measuring an optical property (e.g., reflectance) of the deposited material at a plurality of times after the start of material deposition, and comparing the measurements to values predicted by a defined functional relationship between the optical property and time of deposition (Abstract, Col.2, lines 32 – 45, Col.4, Col.5, lines 1 – 33, Col.6, lines 45 – 67, Col.7, lines 1 – 5, Col.10, lines 39 – 67, Col.11, lines 1 – 49, Col.12, lines 49 – 67, and Cols.13 – 15 of Maung et al.). Regarding **Claim 3**, the combination of Maung et al. and Holland also teaches that the defined functional relationship is theoretically valid at substantially all times during film deposition (see the discussion of Claim 19 above). Regarding **Claim 7**, the combination of Maung et al. and Holland also teaches that the optical property is selected from the group consisting of energy transmittance and energy

reflectance (Figure 1, Col.4, lines 3 – 67 of Maung et al.; Abstract, Col.2, lines 1 – 3, and Col.5, line 1, of Holland). Regarding **Claim 8**, the combination of Maung et al. and Holland also teaches that the predicting comprises using a theoretical formula for the optical property, the formula having at least one theoretical constant (Col.4, lines 55 – 67, and the formulas in Cols.12 – 15 of Maung et al., which contain at least one "theoretical constant"). Regarding **Claims 9 and 10**, the combination of Maung et al. and Holland also teaches that the formula further comprises at least one "compensated constant term" (i.e., the overlap time and interpolation delay that are compensated for by Maung et al.) that is dependent on a measuring device that measures the optical property (Col.10, lines 43 – 67 of Maung et al.).

20. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maung et al. (USPN 5,503,707) in view of Holland (USPN 4,311,725), in further view of Mozumder et al. (USPN 5,661,669).

21. As an alternative to the reasoning presented above in paragraph 19, the combination of Maung et al. and Holland teaches all the limitations of **Claims 9 and 10**, except for a method wherein the formula further comprises at least one "compensated constant term" that is dependent on a measuring device that measures the optical property. However, it is the goal of Maung et al. to provide a fault-tolerant system / process that uses a formula (i.e., the series of equations taught by Maung et al.) to accurately predict the endpoint of a deposition process during the process while compensating for a number of different issues (e.g., faulty

measurements, drift from ideal, etc.). Mozumder et al. teaches that, in the art of optically monitoring a deposition or etching process, it is desirable to utilize a model (i.e., a formula) having a constant term (K) that may be varied to compensate for changes in equipment performance (i.e., a formula that comprises at least one "compensated constant term" that is dependent on a measuring device that measures the optical property (Abstract, Col.2, lines 5 – 18, Col.3, lines 53 – 67, Col.4, lines 1 – 7 and 42 – 56, and Col.6, lines 40 – 44). It would have been obvious to one of ordinary skill in the art to include a "compensated constant term" that is dependent on a measuring device that measures the optical property (e.g., reflectance) in the formula of Maung et al. because doing so would allow the formula of Maung et al. to compensate for changes in equipment performance (as taught by Mozumder et al.), thereby producing a more accurate, fault-tolerant estimation of the deposition endpoint, as desired by Maung et al.

22. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maung et al. (USPN 5,503,707) in view of Holland (USPN 4,311,725), in further view of Arndt (USPN 4,527,510) and Johnston (USPN 4,144,837).
23. Regarding **Claims 15 and 16**, the combination of Maung et al. and Holland teaches an improved method of time controlled deposition of a film onto a substrate to form an optical filter, the improvement comprising measuring an optical property (e.g., light (energy) reflectance) of the film, utilizing the measurement to determine a designed thickness achieving time at which the film will complete, and predicting,

while the film is being deposited, a stop signal initiation time at which to initiate a deposition stop signal that stops the deposition of the film (see the discussion in paragraph 19 above and the passages (i.e., cols., lines) cited therein). The combination of Maung et al. and Holland does not explicitly teach that the stop signal initiation time is dependent on both the designed thickness achieving time and a time delay between the stop signal initiation time and the actual termination of material deposition. However, it is the goal of Maung et al. to provide a fault-tolerant system / process that uses a formula (i.e., the series of equations taught by Maung et al.) to accurately predict the endpoint of a deposition process during the process while compensating for a number of different issues (e.g., faulty measurements, drift from ideal, etc.) so that a film having a desired thickness is deposited. Both Arndt (Abstract, Col.5, lines 46 – 68) and Johnston (Col.2, lines 59 – 68, and Col.3, lines 1 – 12) teach that it is desirable in the coating art to utilize a coating control unit that compensates for the time delay between signaling a coating stoppage time and actually stopping the coating process. Therefore, it would have been obvious to one of ordinary skill in the art to compensate for the time delay between signaling a deposition stoppage time and actually stopping the deposition process (i.e., to make the stop signal initiation time dependent on both the designed thickness achieving time and a time delay between the stop signal initiation time and the actual termination of material deposition) in the process of the combination of Maung et al. and Holland with the reasonable expectation of successfully and advantageously

improving the film-forming process by more accurately stopping the deposition process at a desired film thickness (i.e., by taking any time delay into account).

24. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Southwell et al. (USPN 5,425,964) in view of Arndt (USPN 4,527,510) and Johnston (USPN 4,144,837).

25. Regarding **Claims 15 and 16**, Southwell et al. teaches an improved method of time controlled deposition of a film onto a substrate to form an optical filter, the improvement comprising measuring an optical property (e.g., light (energy) reflectance) of the film, utilizing the measurement to determine a designed thickness achieving time at which the film will complete, and predicting, while the film is being deposited, a stop signal initiation time at which to initiate a deposition stop signal that stops the deposition of the film (see the discussion in paragraph 13 above and the passages (i.e., cols., lines) cited therein). Southwell et al. does not explicitly teach that the stop signal initiation time is dependent on both the designed thickness achieving time and a time delay between the stop signal initiation time and the actual termination of material deposition. However, it is the goal of Southwell et al. to accurately predict the endpoint of a deposition process during the process so that a film having a desired thickness is deposited. Both Arndt (Abstract, Col.5, lines 46 – 68) and Johnston (Col.2, lines 59 – 68, and Col.3, lines 1 – 12) teach that it is desirable in the coating art to utilize a coating control unit that compensates for the time delay between signaling a coating stoppage time and

actually stopping the coating process. Therefore, it would have been obvious to one of ordinary skill in the art to compensate for the time delay between signaling a deposition stoppage time and actually stopping the deposition process (i.e., to make the stop signal initiation time dependent on both the designed thickness achieving time and a time delay between the stop signal initiation time and the actual termination of material deposition) in the process of Southwell et al. with the reasonable expectation of successfully and advantageously improving the film-forming process by more accurately stopping the deposition process at a desired film thickness (i.e., by taking any time delay into account).

Allowable Subject Matter

26. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, for the reasons set forth above in paragraph 9, but no art has been applied against the claims. Claims 4 and 20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 11 – 14 are allowed.

27. The following is a statement of reasons for the indication of allowable subject matter. The prior art of record does not teach or reasonably suggest the following aspects of the claimed invention in conjunction with a method of manufacturing an optical filter by predicting a deposition stop time (e.g., a time when the desired film thickness will be reached) during the filter forming / deposition process: (1) Using the specifically claimed formula that defines transmittance as a function of time to

predict the stop time / determine when the deposition will be complete (Claims 4 and 18), (2) predicting the optimal time of forming the film using an adjusted constant parameter that is obtained by measuring an optical characteristic of the filter at selected points in time by irradiating the film with light, calculating a theoretical value of the optical characteristic using a theoretical formula comprising an adjustable constant parameter, and compensating the adjustable parameter to minimize the difference between the theoretical value and the measured value of the optical characteristic (Claims 11 – 14), and (3) using a model to select a deposition stopping time during film formation by adjusting one or more constant terms in an equation relating an optical characteristic to deposition time so that the differences between measured and calculated values of the optical characteristic are minimized (Claim 20).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mitsuhashi et al. (USPN 6,490,497 B1), Chen et al. (US 2003/0003605 A1), Yu et al. (USPN 5,131,752), Takahashi et al. (USPN 6,481,369 B1), and Berthold (USPN 3,637,294) all teach various methods of controlling the thickness of a thin film (e.g., for use in an optical filter) being either deposited or etched (i.e., determining the end-point of a deposition or etching process).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D Markham whose telephone number is (571)

272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wesley D Markham
Examiner
Art Unit 1762

WDM

SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700